PROCEEDINGS

OF THE

SCIENTIFIC MEETINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 9, 1866.

Alfred Newton, Esq., F.L.S., in the Chair.

Mr. P. L. Sclater called the attention of the Meeting to the young male Gayal (*Bos frontalis*, Lambert), just added to the Society's Menagerie. A pair of this fine species of Bovine animal had been shipped at Calcutta for the Society by their Corresponding Member, the Babu Rajendra Mullick; but the female had unfortunately died upon the passage. A drawing by Mr. Wolf (Plate I.) was exhibited, representing this interesting animal.

Mr. P. L. Sclater remarked that it seemed now to be quite certain that the White-whiskered Lemur, described and figured by Mr. Bartlett (P. Z. S. 1862, p. 347, pl. XLI.) under the name *Lemur leucomystax*, was the female of the Black Lemur (*Lemur macaco*, Gm.). The Society's Menagerie now contained a male and two females of this species, including the original type of *Lemur leucomystax*, purchased in 1861. Dr. Brehm, Director of the Zoological Gardens, Hamburg, had first called Mr. Sclater's attention to the fact that the Black Lemurs were always males, and the White-whiskered ones females, such being the case in the Hamburg Gardens (which contained in August last two males and a female of this species) as well as in this Society's Gardens. The matter, however, had been definitely set at rest by two enterprising Dutch travellers, MM. Pollen and Van Dam, who, during their recent excursion into North-western Madagascar,

had obtained specimens of both of these Lemurs, and determined them as male and female of the same species*.

A letter was read from Sir C. W. Dilke, Bart., F.Z.S., announcing the occurrence of a specimen of the Gyr Falcon (*Falco gyrfalco*) in the Holt forest near Farnham.

Mr. P. L. Sclater read an extract from a letter addressed to him by Dr. H. Burmeister, For. Memb., concerning the *Tyrannidæ* found in the vicinity of Buenos Ayres. These were stated to be

Saurophagus sulphuratus (common),
Tyrannus violentus (common).
—— *aurantio-atro-cristatus* (rare).
Bathmidurus variegatus (rare).
Elainea modesta (rare).
Muscipeta virgata (rare).
Pyrocephalus coronatus (common).
Serpophaga nigricans (rare).
—— *subcristata* (common).
Euscarthmus (*Hapalocercus*) *flaviventris* (rare).

Dr. Burmeister's list was accompanied by drawings and descriptions of two other species of this group, which Mr. Sclater had not been able to determine.

The following extracts were read from a letter addressed to the Secretary by Lieut. R. C. Beavan, Corr. Memb., dated Moulmein, October 23rd, 1865:—

"I have just returned from a trip to Zwagaben (a remarkable limestone rock about twenty-five miles to the north of this, elevation about 2000 feet, and about the only limestone rock in the vicinity which can be climbed) with the Rev. C. G. Parish, the chaplain here, who is well known as a botanist. A day and a half up the Salween by boat at this time of the year brings one to the small village of Korlike; and from this point to the foot of the rock is only four or five miles, through a swamp which has to be traversed on elephant-back. At the foot of Zwagaben we were lucky enough to find a small water-tight zyat or resting-house, well shingled and boarded, no small boon in this land of rain; and this we made our headquarters. The pull up the mountain was very stiff: in places one has to scramble up on all fours; and here and there we came across good teak ladders placed for the accommodation of pilgrims to the pagoda at the top. Both these and the rest-house at the bottom have been erected by some pious Burman or other, with the hope of reward hereafter.

"About a quarter of the way up there is a small village, three or four huts only, and a poongye (priest) house, where we were glad enough to halt and get a drink of water.

* See Dr. Schlegel, Contributions à la Faune de Madagascar et des îles avoisinantes, &c., Ned. Tijdschr. v. d. Dierk. 1865.

"The foot of the hill, or talus, is covered with a dense jungle of bamboos, grass, and forest trees (some of immense height), with clear streams running through it to the plain below. Above this the rock in places is quite perpendicular; and although vegetation in Burmah manages to cover places apparently so, here and there the rock was bare, where even a moss or lichen could scarcely get a footing. Wherever not quite a wall, the rock was covered with creepers and bushes, and the gullies or small watercourses actually produced trees of large size.

"The heat near the top, which is covered with high grass, was very great, the radiation from the black rocks making it more severe; and at this time of the year, just after the rains, the power of the sun is unusually great. Zwagaben, more popularly known by the name of the 'Duke of York's nose,' from its appearance as seen from Moulmein, is mentioned by Mason in his work 'On Burmah,' edit. 1860, as the hill on which the ark is said to have rested (by the Karens) after the deluge. A similar tradition of the Lepchas is quoted at Darjeeling with reference to a hill in that neighbourhood, 'Tendong,' but in both instances is doubtless an idea originally conceived from missionary teaching.

"Halfway up, near the poongye house, I procured specimens of a *Pericrocotus*—a male in scarlet plumage, probably *P. brevirostris*; that curious Nuthatch, *Dendrophila frontalis*; a small robin-like bird, apparently a Shortwing, *Brachypteryx*, sp.; *Rubigula flaviventris*, Tick.; a *Phyllornis*, near *P. jerdoni*, but differing slightly (*P. cochinchinensis*?); a dark-olive-brown *Pycnonotus* (?), and a curious little *Erythrosterna*, perhaps *E. acornaus*, Hodgs.

"Near the top I got a specimen of *Petrocossyphus cyaneus* with remarkably rufous under tail-coverts, and I saw another on the iron-work of the pagoda at the top. The only other birds seen there were a small flock of a species of the genus *Prinia*, in the long grass, and some Swallows and Swifts overhead, besides an occasional Vulture (*Gyps indicus*) soaring several feet below us. Adjutants do not appear to frequent Zwagaben or to breed there, as they do on the other limestone hills in the vicinity. The rocks they nest on are no doubt inaccessible to any but an expert native, who uses his toes like fingers, and can swarm up anything, especially one of these hill-Karens. According to all accounts Adjutants' eggs are very difficult to procure. I have tried in vain since I came to Burmah to get hold of some, and hear that Dr. Squire tried too without success. The top of Zwagaben is the only known locality for that rare little fern, *Adiantum parishii*, which I had the pleasure of gathering myself, guided to the spot, only a few yards square, of course by Mr. Parish himself. About the Karen fortress (Dongyany), mentioned by Mason, distant only a few miles, is found that rare orchid, *Phalænopsis lowii*, of which Mr. Parish succeeded in getting a good supply in flower. The only Crow seen at the foot of the hill was *Corvus culminatus*. *C. splendens* appears to avoid the jungles altogether. About the bottom I found the large Rocket-tailed Drongo (*Edolius paradiscus*) tolerably common. The Shamá

too is common in all the dense jungles in the neighbourhood. A fine specimen of *Gecinus viridanus* killed, and also the *Chrysonotus intermedius* of Blyth. A *Pitta*, new to me, inhabits the bamboo jungles at base; it does not agree with any of Jerdon's descriptions. It may be *P. cyanura*, and is much spotted on the breast. I must keep it for comparison with specimens in our museum. Hearing that the rare *Nemorhædus sumatrensis*, or Goat Antelope, was to be found at the base of the mountain, we determined to have a beat for them, and I was lucky enough to secure a fine female, the spoils of which I will send home to you at an early opportunity. They frequent the talus of the mountain described above, and when disturbed make for the inaccessible parts. Their general appearance is somewhat porcine, between a goat and a hog. I made the following memoranda, which may be interesting:—

"Zwagaben, October 19, 1865.—Female full-grown, but had not had young.

	ft.	in.
Tip of nose to tip of tail	4	6
Tail 5 inches; with hair,	0	7
Shoulder, height (afore), including hoof	2	$10\frac{1}{2}$
Girth, behind forearm	2	10
Ear	0	$8\frac{3}{4}$
Horn along curve, ringed at the base	0	6
Hoof	0	$1\frac{7}{8}$
Mane	0	6
Extreme stretch of legs apart	6	4

"Lacrymal sinus small, slightly developed. General colour black, with a tinge of hoary; inside of ears white, with black tips and edges; belly and tibiæ rufous; throat rufous, white-tipped. Intradigital pores apparently absent. False hoof of fore and hind legs $1\frac{3}{8}$ inch. Irides dark brown. Teats four. Buttocks rufous and white. Said by Karens to have only one young one at a time. Progresses like a goat through the jungle, with a series of jumps when disturbed; utters a kind of half snort, half grunt.

"*Hab.* Grass- and bamboo-covered sides of Zwagaben, and probably other limestone hills in Burmah. Has been seen at Thyet Mayo, in Pegu.

"Native name 'Thorsek,' pronounced Thorzike."

Professor R. Owen, F.R.S., read a memoir "On the Osteology of the Dodo" (*Didus ineptus*, Linn.). The materials upon which Professor Owen's researches were based consisted of about one hundred different bones belonging to various parts of the skeleton, which had been recently discovered by Mr. George Clark, of Mahéberg, Mauritius, in an alluvial deposit in that island. After an exhaustive examination of these remains, which embraced nearly every part of the skeleton, Professor Owen came to the conclusion that previous authorities had been correct in referring the Dodo to the Columbine order, the variations presented, though considerable, being mainly

such as might be referable to the adaptation of the Dodo to a terrestrial life and to different food and habits.

This paper will be published entire in the Society's 'Transactions.'

The following papers were read :—

1. Outlines of a Systematic Review of the Class of Birds. By Professor W. Lilljeborg, of Upsala, F.M.Z.S.

Literature.—We may particularly mention Chr. L. Nitzsch*, C. J. Sundevall†, G. R. Gray‡, J. Cabanis§, and C. L. Bonaparte‖, among those that of late years have devoted their attention to the classification of birds. John Müller¶ has given an important contribution to this classification by his treatise on the apparatus of singing in the larynx inferior in a great number of Passeres.

The contribution given by Nitzsch certainly contains only a very short and incomplete review of the class of birds; but it has notwithstanding a particular scientific value from its attracting attention to the importance that the carotides communes of the birds have in their classification.

The ornithological system given by Sundevall has the merit of being based upon a careful and particular examination of the exterior characters of the birds, and of, for the first time, calling attention to the importance of the wing-coverts in classification, and exhibits a correct idea of the designating characters in the nature of the birds. The structure of the wings generally has been minutely described in the treatise on these organs, and its importance as regards classification held forth. As the wings must be considered to be of the highest importance to a bird, being among those parts that indeed make him a bird, it is natural that a system in which the structure of the wings has been considered should be preferable to any other where the wings have been neglected, or this subject but slightly touched upon, without any minute examination of their structure. The above-mentioned author has, in his 'Svenska Foglarna,' observed the muscular structure of the feet as important in classification, after having previously, for the first time, called attention to the same at the meeting of naturalists in Stockholm in 1851.

* Observationes de Avium arteria carotide communi. Halæ, 1829. (Appendix to a programme by Prosector Fridericus Blumius Ictus.)

† Ornithologiskt system (Transactions of the Royal Academy of Science of Sweden, for the year 1835 (printed 1836), p. 43). Öfver foglarnas wingar (ibid. for the year 1843 (printed 1844), p. 303). Svenska foglarna, 1856.

‡ A List of the Genera of Birds (London, 1841). The Genera of Birds (London, 1844-49).

§ Ornithologische Notizen (Wiegmann's Archiv für Naturgeschichte, 1847, vol. i. pp. 186 and 308). Museum Heineanum (Halberstadt, 1850-63).

‖ Conspectus generum avium (Leyden, 1850–57); Conspectus systematis ornithologiæ (Annales des Science Naturelles, 1857?); Tableaux paralléliques des ordres Linnéens, Anseres, Grallæ, et Grallinæ (Paris, 1856) (Extract from Comptes Rendus des Séances de l'Académie des Sciences); besides several other treatises in different magazines.

¶ Abhandlungen der königl. Akad. der Wissenschaften zu Berlin, 1847, p. 321.

The new genera and species that had been added since Latham's 'Index Ornithologicus' was edited had increased to such a number, and their literature had become so scattered, that such a work as G. R. Gray's systematic 'List of the Genera of Birds,' although only a list of names without characters, was very necessary to science, and the obtaining of the same also highly beneficial. The right of priority has generally been observed in this work. The same author has, in his 'Genera of Birds,' given descriptions of the orders, families, and genera, and even figures of the same. A single species of some genera is represented by a coloured figure; and of others only certain parts, such as the head or the foot of some typical species, have been figured. This work is certainly of great value for the study of birds; and the very good figures often give a necessary explanation to the descriptions of the genera, which at times are but little distinguishable, and are not given in a diagnostic manner.

Cabanis has, in his ornithological system, given good characters for the arranged groups, taken partly from J. Müller's descriptions of the larynx inferior, partly from the nature of the horny covering on the tarsi, first studied by Keyersling and Blasius, and partly from the number of quills and tail-feathers. It is principally the order Passeres to which this author has devoted his attention, and which consequently has obtained an improved classification. It has been divided into two groups (Oscines and Clamatores), and the families have been carefully limited and arranged. This work, with that of Sundevall, may rightly be considered most important in the classification of birds.

The numerous contributions to this classification that have been made by Bonaparte are valuable as giving minute registers of families and species, showing an unusual knowledge of the species, and a sharp distinction between the genera, and often arranging these in a manner corresponding with the demands of the natural affinity; but they are generally only registers of names, often giving the characters for the species, but very seldom for the higher groups.

Bonaparte has published, in the 'Transactions of the Linnean Society,' xviii. p. 258, a systematic arrangement of the class of birds, together with the classes of the other vertebrated animals in general. The first class has been divided into two subclasses—Insessores and Grallatores. The first of these corresponds fully with the one arranged by us under the same name, and the latter includes both Grallæ and Natatores. This classification corresponds also with the one given here, in the Longipennes having their place between the Steganopodes and the Pygopodes. Characters of the orders, families, and subfamilies are also given.

After this brief reference to the literature, we will proceed to a synoptic statement of the principles upon which the systematic arrangement here given rests.

Principles.—We have preferred the progressive method, as it seems to us to be the most rational, from its correspondence with the physiological and geological development. We therefore commence the system with the lowest, and finish it with the highest forms.

Irritability seems to us to be the most distinguishing character for birds; and this should consequently be taken into consideration more than others with regard to their classification. The swimmers seem to us the lowest, from their showing a tendency to the lowest form of vertebrated animals—the fish-form. In the *Aptenodytidæ*, where the wings resemble fins, and where they, as in all other diving birds, serve as such, we have this form most strongly designated. The heavy, clumsy structure, with small wings and short legs, also makes them generally less active than other birds, and shows a lower development of the type of bird. This, however, is not the case with all the swimmers; and the order Longipennes gives us instances where swimmers possess a high degree of activity.

The Passerine birds (Passeres) seem to us to possess the highest irritability, and to be those in which the nature of birds has reached its highest development. We do not by irritability mean the muscular strength alone, but vivacity and activity generally. Where this is most manifold, most changing and constant, it is the most developed. We find in the Passeres "the power to stay and move with ease as well on the ground as in the trees or in the air, and to make their presence known by characteristic melodious notes" (Sundevall); we find them in a constant and manifold motion, and they let us constantly hear their notes either as song or as affectionate voices. The birds of prey have generally been placed highest, and been considered the most developed, in consequence of their muscular strength and strong flight, and their thereby supposed high degree of irritability; but by keeping them in captivity we find at once that the birds of prey are dull birds, and that they, as regards irritability, are far behind the Passeres. They remain for a long time silent and quiet, and do not generally show any activity, unless they are frightened or driven by appetite for food. The Passerine birds, on the contrary, are in captivity constantly in motion, and let us incessantly hear their lively song and affectionate voices. Besides we cannot in a system place the birds of prey far from the lower groups, of the Columbine and the Gallinaceous sections, without violating natural affinities based upon important characters. They correspond with these lower groups as regards external characters in the nature of their wing-coverts, and, as regards interior anatomical characters, in the nature of their carotides communes. Some of them, for instance those of the Vulturine section, exhibit, with regard to their form, a near analogy with some of those of the two mentioned groups. We may, for instance, compare a Condor with a Turkey. A system that places the dirty Vultures highest, does not seem to us to indicate a correct idea of the nature of the birds.

If we do not regard flight, which is common to almost all birds, but consider birds with regard to the various other ways of motion for which they especially are shaped, and for which their structure is also adapted, we find easily that these in general may be comprehended in three different modes, viz.: 1st, swimming on the water; 2nd, running on the ground; and 3rd, climbing and jumping on

the branches of trees*. The hinder extremities or the legs exhibit, in conformity with this, three different forms. This induces us to divide the class of birds into three primary groups or subclasses :— 1, Natatores; 2, Cursores; 3, Insessores. Those belonging to the third group generally move more with the assistance of their wings than the others, except some forms of the Natatores, and show generally a higher development of the bird-type. This group also furnishes the greatest variety of forms. The Natatores include about 550 species, the Cursores 900, and the Insessores 6900 (Bonaparte).

Nitzsch has, in the treatise referred to, divided the class of birds into three groups : Aves aëreæ, Aves terrestres, and Aves aquaticæ, which in a reverse order correspond with the three groups here arranged ; but he differs from us in including the Columbine birds among the Terrestres, and the Grallatorial birds among the Aquaticæ, and in considering the Struthionine birds a distinct group from the other three.

There is, as far as experience yet extends, a very remarkable correspondence between the nature of the upper wing-coverts and of the carotides communes, which adds to the importance of both these characters, which have generally been but little observed. All those birds that have the large upper wing-coverts of the first row on the cubitus so short that they do not reach beyond the middle of the cubital quills, have only one carotis communis, viz. the sinistra. Those birds in which the above-mentioned wing-coverts form several rows and extend beyond the middle of the cubital quills, have, on the contrary, generally two carotides communes, viz. one dextra and one sinistra. The only exceptions to this rule are *Cypselus*, *Trochilus*, *Merops*, one or a few species of *Psittacus*, *Rhea*, *Phœnicopterus*, *Podiceps*, and *Pelecanus*, which, although belonging to the latter category in regard to the wing-coverts, yet have only one carotis communis. This is the dextra in *Phœnicopterus*. We do not, therefore, hesitate to consider these two characters to be among the most important in judging of the affinity of the birds ; and they show with certainty that the birds of prey have not their place at the beginning or at the end of the system.

The Strisores, one of the twelve orders in which we have arranged the class of birds, includes several birds that we formerly considered should belong to the Passeres, from their near correspondence in form with the latter. But as they deviate from them in regard to the upper wing-coverts and the claw of the hind toe, and sometimes even in regard to the carotides communes, we are of opinion that they should be regarded as belonging to a different order. They have been separated from the Passeres by Sundevall† and by Nitzsch ; and the former has arranged them under the order Coccyges, which, according to him, also includes the *Zygodactyli* and *Columbæ*. They are, however, distinct from the Zygodactyli in the nature of their feet, and cannot be arranged under this order without depriving

* The second mode appears an intermediate link between the first and third.

† Kongl. Vetensk. Acad. Handl. 1843, pp. 375 & 376.

it of its most distinguishing character. They seem also to cause confusion if they are arranged within either of the orders Passeres or Zygodactyli; and we have therefore considered it right to arrange them as a distinct order—Strisores, which name was given to them by Cabanis in 1847. However distinct they seem to be, as well from the Columbine section and the Birds of prey as from the Zygodactyli, it is very difficult to find any character that sharply and distinctly distinguishes them from these three orders; and we have been compelled to use a character in the scheme that does not belong to all, although the majority of them possess it. They appear to be an intermediate group between Accipitres, Zygodactyli, and Passeres.

The order Longipennes has generally had a very changeable place in the system, sometimes the first among the swimmers, sometimes the last. When the swimmers are, as here, arranged in two groups according to the form of the beak, their place is, as will be seen from the scheme, unquestionable, as we of course must begin with the Pygopodes. The Longipennes approach these very nearly in the genera *Puffinus* and *Halodroma*. *Puffinus* has, together with *Colymbus* and *Podiceps*, a long pyramidal erect process at the upper end of the tibia, and the tarsi are compressed like theirs. The genera *Phalacrocorax* and *Mergus* form an intermediate link between the Steganopodes and the Lamellirostres.

First Division or Subclass.

NATATORES, Illiger; Sundevall.

Upper part of the crus (tibia and fibula) not free, but drawn in within the skin that covers the body *. The basis of the hind toe above that of the anterior toes, the hind toe sometimes absent. Legs short; and the anterior toes, sometimes even the hind toes, united by web. The upper large wing-coverts of the first row on the lower arm (antibrachium) extend in all beyond the middle of the cubital quills. All, with the exception of *Podiceps*, have, as far as is known, two carotides communes.

Group 1. SIMPLICIROSTRES.

The bill without laminæ. Doubly monogamous†. "Altrices;" that is, carry food to their young.

Order 1. Pygopodes, Illiger.

The legs are placed far back; and the hind toe is, when it is present, free. The wings short, hardly extending to the base of the tail. The tail short, or none at all. Heavy, clumsy birds, that dive well, but walk badly.

Note.—This order contains the typical forms of Natatores.

* Some of the Longipennes are said to form an exception to this.

† Both the old ones sit on the eggs, take care of the young, and carry food to them.

Order 2. Longipennes, Duméril.

The legs are not so far back; and the hind toe, when there is one, is free. The wings long, extending more or less beyond the base of the tail. They are generally light birds, and lie, when swimming, shallow in the water, and cannot, with a few exceptions, dive, unless they dart from the air into the water, which power a great many of them possess. They generally fly remarkably well.

Order 3. Steganopodes, Illiger.

The hind toe united to the inner anterior toe by a web, and its base but slightly raised above that of the anterior toes. The wings and tail rather large, the former sometimes pointed and sometimes obtuse. Some of these birds are pelagic, fly remarkably well, and are darting divers; some fly badly, but dive and swim well. The position of the hind toe enables some of them at times to sit on the branches of trees and to build their nests there.

Group 2. LAMELLIROSTRES.

The bill with laminæ. Generally singly monogamous*. "Præcoces;" that is, do not carry food to their young.

Order 4. Lamellirostres, Cuvier.

The point of the upper jaw with a so-called nail of the bill; the other part of the bill covered with a soft skin. The hind toe free. The body generally more or less thick and heavy. The power of flight sometimes moderate, sometimes rather inferior. Those that fly best dive badly, or cannot dive at all; the others lie, when swimming, deep in the water, and dive exceedingly well. Some of the former are rather fast walkers, and approach in this respect the next division.

Second Division or Subclass.

CURSORES, Illiger; Sundevall.

The entire crus and the lower part of the femur free. The base of the hind toe above that of the anterior toes†; the hind toe sometimes missing. The anterior toes, when united by a web, are, with very few exceptions, so united only at the base. The large upper wing-coverts of the first row on the lower arm extend beyond the middle of the cubital quills. They have, with the exception of *Rhea* and *Phœnicopterus*, as far as is known, two carotides communes.

Order 5. Grallæ, Linné.

The legs high, and the lower part of the crus without feathers‡. The wings well adapted for flying. The pectoral bone with a crista.

* The female alone cares for the young.

† The majority of the *Ardeidæ* make an exception to this; and these live and build very often in trees.

‡ The genus *Scolopax* deviates from this.

They generally walk and run with ease or very fast, and mostly live in damp places, near swamps or on the banks of watercourses. The majority fly fast and with ease; some fly badly. They live generally in the middle ("mittlere," Faber) monogamy*. Præcoces. A great number of the *Ardeidæ* are Altrices.

Order 6. Brevipennes, Duméril.

The wings more or less rudimentary, and not adapted to flight. Pectoral bone without crista. A small number of large birds that run fast, and may be considered typical of the whole group. Their structure exhibits a strong tendency towards the mammalian. Some are said to live in the middle monogamy, others in single monogamy, and others again in polygamy. Præcoces.

Order 7. Gallinæ, Linné.

The legs of a mediocre height, and the entire crus feathered†. The wings adapted to flying, but generally rather short and obtuse, and more or less bent. They run fast; but are easily fatigued by flying, and then hide among rocks, bushes, grass, &c. Some live in polygamy, but the majority live in middle monogamy. Præcoces.

Third Division or Subclass.

INSESSORES, Vigors; Bonaparte.

The entire crus and the lower part of femur free. The coat of feathers generally extends at least to the tarsal joint‡. The hind toe with its base on a level with that of the anterior toes§, and very seldom missing.

Order 8. Pullastræ, Sundevall.

The bill not covered by a cere at the base, but generally naked there, and with an inflated skin at the nostrils. The point of the upper jaw rounded, but very seldom bent down in the form of a hook. Three toes directed forward, and not united together. The large upper wing-coverts of the first row on the lower arm extend beyond the middle of the cubital quills. Two carotides communes. The majority fly very fast; some do not fly so well, but these run fast. The majority live in double monogamy, a few in middle or single monogamy (*Penelope*), and a few in polygamy (*Crax*). The majority are Altrices, the others Præcoces.

Note.—This order is evidently an intermediate group between Cursores and Insessores. The *Talegallinæ*, *Penelopidæ*, and *Didunculidæ* exhibit some tendency towards the Accipitres.

* Both the old ones attend to their young, but do not carry food to them, letting them, under their care, hunt for their own food.

† The genus *Ortyxelos*, Vieill., is an exception to this.

‡ *Didunculus* (*Pleiodus*) deviates from this, and has the lower part of the crus naked.

§ The *Cathartini* form an exception to this.

Order 9. Accipitres, Linné.

The bill covered with a cere at the base, convex towards the point; and the point of the upper jaw bent down in the form of a hook. The legs strong, with three anterior toes, which are not united and are, like the hind toe, armed with strong bent claws. The wings large, with the large upper wing-coverts of the first row on the lower arm extending beyond the middle of the cubital quills. Two carotides communes. They have a strong power of flying, but run badly*, and do not jump. Doubly monogamous. Altrices. Their food consists generally of vertebrated animals.

Order 10. Strisores, Cabanis.

The bill without a cere, hard at the base, without any swollen skin at the nostrils, and of a variable form. Three anterior toes, which are generally united at the base, sometimes there united by a web, and seldom free. The hind toe is at times turned forwards. The claw of the hind toe is smaller than the claw on the middle anterior toe (Sundevall). The large upper wing-coverts of the first row on the lower arm extend beyond the middle of the cubital quills. Some of them (*Caprimulgus, Coracias, Alcedo*) have two carotides communes, and some (*Cypselus, Trochilus, Merops*) have only one. *Buceros* is unknown as regards its carotides. Some fly remarkably well, others not so well. The legs are short in most of them, and not well adapted for walking. Doubly monogamous. Altrices.

Note.—A polymorphic group, that shows a tendency as well towards the Accipitres and Zygodactyli as towards the Passeres.

Order 11. Zygodactyli, Vieillot.

Two anterior and two hind toes, or sometimes two anterior and one hind toe†, or one hind toe and three anterior ones, the exterior one of which is turned backwards. The claws compressed. The large upper wing-coverts of the first row on the lower arm, except in the *Picidæ* and *Bucconidæ*, do not extend beyond the middle of the cubital quills. Some have two carotides communes, and others (*Picus, Ramphastos, Cacatua*) only one. The power of flying not very good. They generally walk badly on the ground; but a great many of them climb well on the trees, and cling skilfully to the branches. Doubly monogamous. Altrices.

Order 12. Passeres, Linné; Sundevall.

Three anterior toes and one hind toe, and the exterior anterior toe generally at the base united with the middle one. The claw of the the hind toe as large as that of the middle anterior toe; and its long flexor muscle separated from the muscle that bends the claw phalanx of the anterior toes (Sundevall). The large upper wing-coverts of

* *Gypogeranus* deviates from this.

† The thumb or the proper hind toe, which corresponds with the inner hind toe in the others, is in this case missing, except in the *Trogonidæ*.

the first row on the lower arm do not extend beyond the middle of the cubital quills, and we meet with only one row of greater upper wing-coverts. As far as known, only one carotis communis, or truncus caroticus impar, which arises from the left arteria subclavia. Lively and active birds, with a fast and excellent flight, which move easily as well on the ground as on the branches of the trees. They generally jump on the ground, and seldom run. Some of them have a separate muscular apparatus for singing in the larynx inferior and a more or less exquisite song. Doubly monogamous. Altrices.

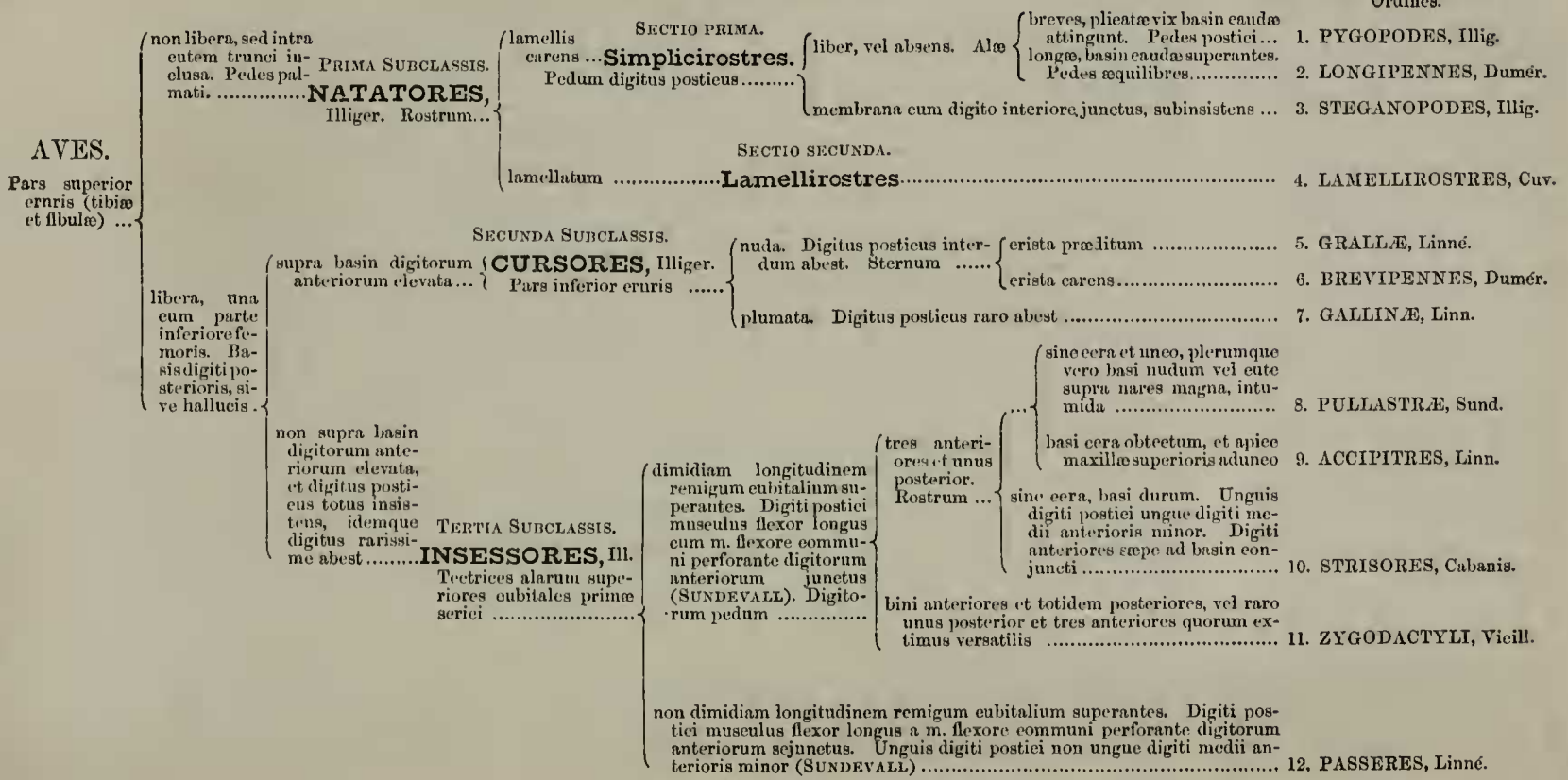
Note.—This order embraces the typical forms of the group Insessores, and the birds that generally have the highest degree of development.

In the following tables I have tried to use the most important as well as the most positive and evident characters, but have in this, like others, met with much difficulty of finding such for the smaller groups, or families and genera, in the higher orders. A great many of the characters used are taken from Sundevall; and in the Passeres several from Cabanis. Their validity has first been fully tested. In consequence of the above-mentioned difficulty we find that the place in the system of a form in question cannot always be ascertained from similar tables, as a more minute description is often necessary. It must not, therefore, be expected that these tables should give an infallible ground for the determination of the forms belonging to the respective families and subfamilies, but only that they should denote some of the most important characters that form the basis for the groups, and give an easy review of these groups. Such a table shows us most plainly what characters are common and what are not.

As a great many of the exotic generic forms are not well known to me, I do not insist that they can be all arranged under the 69 families and 144 subfamilies here characterized, and that the arrangement of other families or subfamilies is unnecessary; but I believe that a great part of the genera have been considered. I may mention that the difficulties arising in limiting the families *Corvidæ*, *Paridæ*, and *Sylvidæ* among the Passeres have induced me to make these families more comprehensive than they have been.

It seems that the *Epimachini* and *Paradiseini* should together form a separate family; but I have not been able to find any distinguishing characters, common to both, that make them distinct from the *Corvidæ*. The family *Corvidæ* corresponds with "cohors *Corviformes*," of Sundevall (Svenska Foglarna). The *Troglodytini* include forms of both *Troglodytinæ* and *Timalinæ*, Cabanis, excepting some with emarginated bill. The other *Liotrichidæ*, Cabanis, are given to the *Sylvidæ*, partly to *Lanini* and partly to *Sylvini*. It seems that the family *Brachypodidæ* as arranged by Cabanis should at least partly be included in the last-mentioned subfamily (*Sylvini*), which, as it also embraces the *Sylviadæ*, Cabanis, is very rich, and contains about 500 species or more. I even include the *Vireoninæ*, Cabanis, in the *Sylvicolini*.

Tab. I^ma. CONSPECTUS ORDINUM.



Tab. II^da. CONSPECTUS FAMILIARUM.

Familiæ.

- **PYGOPODES.** Alæ remigibus et pollice..
  - carentes ..... 1. Aptenodytidæ, Sund.
  - præditæ. Pedes digito postico ...
    - carentes ..... 2. Alcidæ, G. Gray.
    - præditi
      - palmati ..... 3. Colymbidæ, Sund.
      - lobati ..... 4. Podicipidæ.
- **LONGIPENNES.** Nares
  - prominulæ, tubuliformes, et digitus posterior nullus, vel tantum ungue immobili denotatus ..... 5. Procellaridæ, Sund.
  - solito modo formatæ ..... 6. Laridæ, Sund.
- **STEGANOPODES.** Rostrum unco
  - carens, et acies maxillarum serrata ..... 7. Dysporidæ, Sund.
  - præditum, et acies maxillarum integra ..... 8. Pelecanidæ, G. Gray.
- **LAMELLIROSTRES.** Rostri lamellæ
  - denticulis serræ similes et, saltem in maxilla superiore, retro vergentes, ejusque unguis unciformis ..... 9. Mergidæ, Bonap.
  - tenues et denticulis serræ dissimiles, ejusque unguis non unciformis. Rostrum latius ..... 10. Anatidæ, G. Gray.

Sectio *Anatiformes*.

- **GRALLÆ.** Rostrum...
  - lamellatum ..... 11. Phœnicopteridæ, Bonap.
  - simplex. Alæ...
    - Sectio *Amblypteræ*. obtusæ: remigum primorum secundus ad quintum reliquis longiores, et remiges cubitales longi. Alæ .....
      - plus vel minus breves, et os humeri, retro versum, non acetabulum superans. Pedum digiti .....
        - longi, et hallux prope apicem inferiorem tarsi affixus. Tarsi antice .....
          - transversim scutellati ..... 12. Rallidæ, Sund.
          - reticulati ..... 13. Palamedeidæ, G. Gray.
        - breves, et hallux plus vel minus alte affixus ..... 14. Psophidæ, Bonap.
      - longæ, et os humeri, retro versum, acetabulum superans. Apertura nasalis inter ossa maxillaria et intermaxillaria, ...
        - parva et non ultra medium rostri porrecta. Basis digiti postici.....
          - una cum basi digitorum anteriorum in eodem plano posita
          - plus vel minus supra basin digitorum auteriorum elevata 15. Ardeidæ, Sund. 16. Ciconidæ, Bonap.
        - magna et ultra medium rostri porrecta. Basis digiti postici admodum elevata ..... 17. Gruidæ, Bonap.
    - Sectio *Oxypteræ*. acutæ, et remigum primorum primus vel secundus ceteris longior, interdum tamen secundus et tertius æquales. Rostrum...
      - molle et flexibile, longum et tenue, margineque inferiore maxillæ inferioris angulo carente. Digiti anteriores longiusculi. Orbitæ infra
        - apertæ ..... 18. Totanidæ.
        - clausæ ..... 19. Scolopacidæ, Bonap.
      - durum, plerumque breve, apicem versus crassius, margineque inferiore maxillæ inferioris angulato. Digiti breviusculi. Maxilla superior pone apicem.....
        - integra ..... 20. Charadriidæ, Bonap.
        - incisa ..... 21. Otididæ.

- **BREVIPENNES.** Nares
  - in loco solito positæ ..... 22. Struthionidæ, Sund.
  - ad apicem rostri longi positæ ..... 23. Apterygidæ, G. Gray.
- **GALLINÆ.** Alæ.....
  - breves et obtusæ. Digiti anteriores basi .....
    - disjuncti ..... 24. Crypturidæ, Sund.
    - plus vel minus cute conjuncti. Margo superior rostri ante nares .....
      - arcum continuum formans. Rostri basis cute carnosa carens.. 25. Tetraonidæ, Sund.
      - impressus. Rostri basis cute carnosa obtecta ..... 26. Phasianidæ, Sund.
  - longæ et acuminatæ. Remex primus vel secundus ceteris longior ..... 27. Pteroclidæ, Sund.
- **PULLASTRÆ.** Digiti anteriores basi.....
  - cute conjuncti. Ungues .....
    - parum arcuati, unguisque digiti posterioris ceteris non major ..... 28. Megapodidæ, G. Gray.
    - valde arcuati, unguisque digiti posterioris ceteris major ..... 29. Penelopidæ, Sund.
  - disjuncti. Maxilla inferior.....
    - antice non dentata ..... 30. Columbidæ, Sund.
    - antice dentata ..... 31. Didunculidæ, Bonsp.

Sectio *Diurni*.

- **ACCIPITRES.** Oculi .....
  - laterales. Unguis digiti posterioris
    - ungue digiti anterioris medii non major. Ungues obtusi. Caput plus vel minus nudum..... 32. Vulturidæ, Sund.
    - ungue digiti anterioris medii major. Ungues acuti. Caput plumatum ..... 33. Falconidæ, Sund.

Sectio *Nocturni*.

- antrorsum conversi..... 34. Strigidæ, Sund.

- **STRISORES.** Digiti anteriores
  - cute mobili conjuncti. Rictus maximus. Remiges cubitales longi ..... 35. CAPRIMULGIDÆ, Sund.
  - non cute mobili conjuncti, quamvis interdum plus vel minus concreti. Remiges cubitales
    - brevissimi, non basin caudæ assequentes. Alæ longæ et arcuatæ. Rostrum
      - breve et basi latum. Digitus posticus plerumque antrorsum versatilis ..... 36. CYPSELIDÆ, Sund.
      - longum et tenue. Digitus posticus non versatilis 37. TROCHILIDÆ, Sund.
    - longiusculi, et basin caudæ superantes. Digiti anteriores basi...
      - disjuncti. Vibrissæ rigidæ ..... 38. CORACIDÆ, Sund.
      - concreti. Pedes..
        - parvi, tarsis brevibus. Rostrum
          - deorsum arcuatum ..... 39. MEROPIDÆ, Sund.
          - rectum, vel parllo recurvum.. 40. ALCEDINIDÆ, G. Gray.
        - magni, tarsis satis longis vel mediocribus, interdum tamen breviusculis ..... 41. BUCEROTIDÆ, Sund.

- **ZYGODACTYLI.** Pedum digitus extimus sive quartus
  - antrorsum versatilis ..... 42. MUSOPHAGIDÆ, Sund.
  - non versatilis. Digitus secundus ...
    - retrorsum versus ..... 43. TROGONIDÆ, Sund.
    - antrorsum versus. Rostrum
      - cera carens. Lingua
        - non extendi potest. Digiti anteriores .....
          - usque ad apicem exteriorem phalangis secundæ concreti ..... 44. GALBULIDÆ, Sund.
          - non usque ad apicem exter. phalangis secundæ concreti, sed tantum
            - ad apicem exteriorem primæ phalangis. Rostrum .....
              - capite non duplo longius. Nares in loco solito positæ. Vibrissæ plerumque adsunt... 45. BUCCONIDÆ, Sund.
              - maximum, plerumque duplo vel magis capite longius. Nares in parte superiore rostri positæ, et non cute circumdatæ. Vibrissæ absunt. 46. RAMPHASTIDÆ, Bonap.
            - prope basin. Vibrissæ nullæ ..... 47. CUCULIDÆ, Sund.
        - lumbriciformis, extendi potest ..... 48. PICIDÆ, Bonap.
      - cera instructum. Apex maxillæ superioris aduncus ..... 49. PSITTACIDÆ, Bonap.

- **PASSERES*.** Planta, sive pars posterior tarsi .....
  - Sectio prima.
    - scutulis pluribus corneis minoribus, vel interdum extus una et intus nulla lamina cornea obtecta. Plerumque apparatu canendi carent ..... *Clamatores*, A. Wagner; Cabanis.
  - Sectio secunda.
    - laminis duabus corneis, marginibus posterioribus connexis, integris obtecta. Apparatu canendi in larynge inferiore præditi ..... *Oscines*, Pallas; Cabanis.

- ***CLAMATORES.*** Apparatus canendi .....
  - abest. Maxilla intus apicem versus ..
    - excavata. Scutula anteriora tarsorum
      - etiam latus interius plantæ obtegentia. Maxilla superior pone apicem plerumque integra ... 50. ANABATIDÆ, Sund.
      - non latus interius plantæ obtegentia. Maxilla superior pone apicem incisa. Planta.....
        - reticulata.
          - tantummodo duo basi connexi.
            - integri ..... 51. AMPELIDÆ, Sund.
            - serrati ..... 52. PHYTOTOMIDÆ, Bonap.
          - Digiti anteriores ..
            - Margines maxillarum .....
            - omnes basi connexi, tamen majore ex parte medius et exterior 53. PIPRIDÆ, Sund.
        - non reticulata, latere exteriore obtecto...
          - tarsi scutulis anterioribus, quæ
            - longi et tenues..... 54. PLATYRHYNCHIDÆ, Sund.
            - breves vel mediocres. 55. TYRANNIDÆ, Sund.
          - retro extensa sunt. Tarsi ...
          - lamina integra vel divisa ..... 56. ERIODORIDÆ, Cabanis.
    - fere plana ..... 57. UPUPIDÆ, Bonap.
  - adest. Remiges cubitales interiores
    - producti. Unguis hallucis minus quam ungues digitorum ceterorum arcuatus .. 58. ALAUDIDÆ, Sund.
    - non producti. Unguis hallucis ceteris similis ..... 59. BOMBYCILLIDÆ†.

---

* Ordo Passerum hic eodem principio, quod Sundevall in descriptione avium Succiæ attulit, nititur.

† Quamvis apparatu canendi instructi, tamen *Bombycillidæ* affinitatem proximam cum *Ampelidis* præbere videntur.

Familiæ.

- *OSCINES.* Pars anterior tarsorum .....
  - scutulis pluribus obtecta. Lingua .
    - tubulosa, neque tubulosa, neque extensilis. Angulus menti ..
      - longe porrectus, et ante nares positus. Rostrum magnum, plerumque plus vel minus conicum. Pedes validi ..... 61. CORVIDÆ, Bonap.
      - non longe porrectus. Margines mandibulæ
        - acuti et inflexi. Rostrum crassum, conicum, raro perspicue incisum pone apicem maxillæ superioris ..... 62. FRINGILLIDÆ, Bonap.
        - non acuti vel inflexi. Numerus remigum primorum
          - 9. Rostrum pone apicem incisum. Alæ
            - mediocres, complicatæ, non 10es tarso longiores. Remiges cubitales interiores .....
              - non producti ..... 63. TANAGRIDÆ, Sund.
              - producti et interdum apicem alæ attingentes ... 64. MOTACILLIDÆ, Bonap.
            - longissimæ, complicatæ, circiter 10es tarso, qui brevis est, longiores. Rostrum tenue et depressum ..... 65. HIRUNDINIDÆ, Bonap.
          - 10. Rostrum pone apicem maxillæ superioris
            - integrum ..... 66. PARIDÆ, Bonap.
            - incisum ..... 67. SYLVIDÆ, Bonap.
  - maxima ex parte lamina una et integra obtecta. Remiges primores 10. Nares
    - plumis plus vel minus obtecto ..... 68. REGULIDÆ*.
    - nudæ ..... 69. TURDIDÆ, Bonap.

* *Regulidæ* affines *Paridis* esse videntur, sed pedum et rostri structura plane diversa gaudent.

TAB. III^tia. CONSPECTUS SUBFAMILIARUM.

Subfamiliæ.

- APTENODYTIDÆ ..... 1. *Aptenodytini.*
- ALCIDÆ ..... 2. *Alcini*, Bonap.
- COLYMBIDÆ ..... 3. *Colymbini*, Bonap.
- PODICIPIDÆ ..... 4. *Podicipini*, G. Gray.
- PROCELLARIDÆ ..... 5. *Procellarini*, Bonap.
- LARIDÆ. Maxilla superior
  - adunca ..... 6. *Larini*, Bonap.
  - non adunca ..... 7. *Sternini*, Bonap.
- DYSPORIDÆ ..... 8. *Dysporini.*
- PELECANIDÆ ..... 9. *Pelecanini*, Bonap.
- MERGIDÆ ..... 10. *Mergini*, Bonap.
- ANATIDÆ. Hallux
  - lobatus ..... 11. *Fuligulini*, Swains.
  - non lobatus ..... 12. *Anatini*, Swains.
- PHŒNICOPTERIDÆ ..... 13. *Phœnicopterinæ*, Bonap.
- RALLIDÆ. Digiti anteriores
  - basi cute conjuncti, et præterea lobati ..... 14. *Fulicinæ.*
  - disjuncti. Ungues
    - mediocres, arcuati ..... 15. *Rallinæ*, Bonap.
    - longissimi, recti vel parum arcuati ..... 16. *Parrinæ*, Bonap.
- PALAMEDEIDÆ ..... 17. *Palamedeinæ*, Bonap.
- PSOPHIDÆ. Hallux
  - mediocris, ex parte insistens ..... 18. *Psophinæ*, G. Gray.
  - brevissimus, minime insistens ..... 19. *Dicholophinæ.*
- ARDEIDÆ. Rostrum
  - cultriforme ..... 20. *Ardeinæ*, Bonap.
  - non cultriforme, apice maxillæ plus vel minus adunco ..... 21. *Scopinæ*, Bonap.
- CICONIDÆ. Rostrum
  - cultriforme ..... 22. *Ciconinæ*, Bonap.
  - non cultriforme
    - depressum, apice expanso et rotundato ..... 23. *Plataleinæ*, Bonap.
    - teretiusculum, saltem apicem versus arcuatum ..... 24. *Tantalinæ*, Bonap.
- GRUIDÆ ..... 25. *Gruinæ*, Bonap.

		Subfamiliæ.
TOTANIDÆ. Pedes ...	longi. Tarsus plerumque* quarta parte alæ complicatæ longior. Digiti anteriores plus vel minus cute conjuncti. Pedes ... longissimi. Tarsus tertia parte alæ complicatæ longior. Hallux minus, vel absens ...	26. *Recurvirostrinæ*, Bonap.
	longi. Tarsus non vel vix tertia parte alæ complicatæ longior. Hallux insistens	27. *Totaninæ*, G. Gray.
	mediocres. Tarsus quarta parte alæ complicatæ brevior. Digiti anteriores ..... lobati, et basi cute conjuncti	28. *Phalaropodinæ*, Bonap.
	non lobati	29. *Tringinæ*, Bonap.
SCOLOPACIDÆ		30. *Scolopacinæ*, Bonap.
CHARADRIIDÆ. Digiti anteriores	lati, late limbati, basi conjuncti. Rostrum tarso longius	31. *Hæmatopodinæ*, Bonap.
	mediocres, non vel parum limbati. Rostrum non tarso longius. Os parvum, et anguli oris non pone basin rostri positi	32. *Charadriinæ*, Gray.
	majus, et fissura oris pone basin rostri extensa. Hallux abest	33. *Cursoriinæ*, G. Gray.
	adest	34. *Glareolinæ*, Bonap.
OTIDIDÆ		35. *Otidinæ*, Bonap.
STRUTHIONIDÆ		36. *Struthionini*, Bonap.
APTERYGIDÆ		37. *Apterygini*, G. Gray.
CRYPTURIDÆ. Rostrum	basin versus paullo depressum, et apicem versus vix compressum. Cauda brevissima et obtecta, vel nulla. Hallux plerumque adest	38. *Tinaminæ*, G. Gray.
	compressum, præsertim apicem versus. Cauda plus vel minus distincta. Hallux abest	39. *Turnicinæ*, G. Gray.
TETRAONIDÆ. Tarsi	nudi. Cutis supra nares nuda	40. *Perdicinæ*, Bonap.
	plus vel minus plumosi. Cutis supra nares plumosa	41. *Tetraoninæ*, Bonap.
PHASIANIDÆ. Cauda	depressa, brevis, et magna ex parte tectricibus obtecta	42. *Numidinæ*, Bonap.
	depressa, plus vel minus longa, et maxima ex parte visibilis. Caput et collum ex parte nuda	43. *Meleagrinæ*, G. Gray.
	depressa, plus vel minus longa, et maxima ex parte visibilis. Caput et collum plumata	44. *Pavoninæ*, Bonap.
	plus vel minus compressa et erecta	45. *Phasianinæ*, Bonap.
PTEROCLIDÆ. Tarsi	plumati	46. *Pteroclinæ*, Bonap.
	nudi. Nares non obtectæ	47. *Thinocorinæ*, Bonap.
	nudi. Nares obtectæ	48. *Chionidinæ*, Bonap.
MEGAPODIDÆ. Caput et collum	plumata	49. *Megapodinæ*, Swains.
	ex parte nuda, et tantummodo plumis raris piliformibus obsita	50. *Talegallinæ*, Bonap.
PENELOPIDÆ. Rostrum	altum, breve, usque a basi convexum	51. *Cracinæ*, G. Gray.
	oblongum, tantummodo apicem propius convexum	52. *Penelopinæ*, Bonap.
COLUMBIDÆ. Tarsus	digito medio æqualis, vel longior	53. *Gourinæ*, G. Gray.
	digito medio brevior. Rostrum gracile	54. *Columbinæ*, Illig.
	digito medio brevior. Rostrum breve et crassum	55. *Treroninæ*, G. Gray.
DIDUNCULIDÆ		56. *Didunculinæ*, Bonap.
VULTURIDÆ. Hallux una cum ungue	digitis anterioribus minor, et supra basin eorum affixus	57. *Cathartini*, De Lafr.
	digito interiori circiter æqualis	58. *Vulturini*, Illig.
FALCONIDÆ. Mentum ...	barbatum	59. *Gypaëtini*, Bonap.
	non barbatum. Pone aures ..... nullum collare. Rostrum non dentatum. Alæ ... medium caudæ superantes. Lora obtecta. Cauda sectis. truncata vel rotundata. Pars anterior tarsi .. plus vel minus reticulata. Digitus extimus ..... non versatilis	60. *Polyborini*, Bonap.
	versatilis	61. *Pandionini*, Bonap.
	plumata, vel plus vel minus scutis transversis obtecta	62. *Aquilini*, Swains.
	bifurca vel emarginata	63. *Milvini*, Bonap.
	plumis densis	64. *Pernini*.
	non mediam caudam superantes. Duæ mediæ rectrices producteæ	65. *Gypogeranini*, Bonap.
	non producteæ	66. *Asturini*, G. Gray.
	pone apicem maxillæ superioris dentatum	67. *Falconini*, Bonap.
	collare plus vel minus distinctum, plumis apicem versus latioribus et incurvis formatum	68. *Circini*, Bonap.

* Genera *Tringoides* et *Terekia*, et species *Limosa rufa* ab hoc charactere discedunt.

		Subfamiliæ.
STRIGIDÆ.	Apertura auris lobo cutaneo sive valvula ... carens. Radiata area facialis incompleta	69. *Surnini*, Bonap.
	... prædita. Radiata area rotundata	70. *Strigini*, Bonap.
	... facialis completa ... infra acuminata, subtriangularis. Unguis digiti medii intus pectinatus	71. *Hybridini**.
CAPRIMULGIDÆ.	Unguis digiti medii intus pectinatus. Rostrum invalidum	72. *Caprimulgini*, Bonap.
	... non pectinatus. Rostrum validum	73. *Steatornithini*, G. Gray.
CYPSELIDÆ.	Hallux antrorsum versatilis	74. *Cypselini*, Bonap.
	... non versatilis	75. *Collocalini*.
TROCHILIDÆ.	Digiti anteriores basi disjuncti	76. *Trochilini*, Bonap.
	... conjuncti	77. *Phaëthornithinæ*, G. Gray.
CORACIDÆ		78. *Coracini*, Bonap.
MEROPIDÆ.	Rostrum marginibus serratis	79. *Prionitini*, Bonap.
	... integris	80. *Meropini*, Bonap.
ALCEDINIDÆ.	Rostrum basi compressum	81. *Alcedinini*, Bonap.
	... latum, nec compressum	82. *Halcyonini*, G. Gray.
BUCEROTIDÆ		83. *Bucerotini*, Bonap.
MUSOPHAGIDÆ.	Hallux versatilis	84. *Colini*, Bonap.
	... non versatilis	85. *Musophagini*, Swains.
TROGONIDÆ		86. *Trogonini*, Bonap.
GALBULIDÆ		87. *Galbulini*, Bonap.
BUCCONIDÆ.	Tarsus digito exteriore brevior	88. *Bucconini*, Bonap.
	... longior, vel æqualis	89. *Capitonini*, Bonap.
RAMPHASTIDÆ		90. *Ramphastini*, Bonap.
CUCULIDÆ. Nares	non in fossa vel apertura nasali, extus visibili, inter ossa nasi et maxillaria, positæ, et plus vel minus apertæ sunt. Rostrum magnum et crassum	91. *Phœnicophæini*, G. Gray.
	in fossa vel apertura nasali, extus visibili, positæ, et plus vel minus membrana vel scuto obtectæ. Cauda longa, cuneata, rotundata. Rostrum ... longum, rectum, maxilla tantum ad apicem arcuata	92. *Saurotherini*, Bonap.
	... mediocris, emarginata. Rostrum ... breve, maxilla superiore fere usque a basi incurva	93. *Cuculini*, Bonap.
	... mediocris, emarginata. Rostrum breve et crassum	94. *Indicatorini*, Swains.
PICIDÆ.	Rectrices molles, apice rotundato	95. *Jyngini*, Bonap.
	... rigidæ, apice plus vel minus acuto	96. *Picini*, Swains.
PSITTACIDÆ. Tarsus	non digito anteriore interiore, ungue excepto, longior. Oculi ... area faciali incompleta circumdati	97. *Strigopini*, Bonap.
	... non area faciali circumdati. Lingua ... parva, tenuis, cylindrica	98. *Microglossini*, Bonap.
	... lata depressa et carnosa. Cauda ... brevis, rotundata vel æqualis	99. *Psittacini*, Illiger.
	... plus vel minus longa et cuneata	100. *Araini*, G. Gray.
	digito anteriore interiore, ungue excepto, longior. Ungues breves et valde incurvi	101. *Platycercini*, Swains.
	... longi et parum incurvi	102. *Pezoporini*, Bonap.
ANABATIDÆ.	Digitus extimus medio circiter æqualis	103. *Dendrocolaptini*, G. Gray.
	... medio brevior. Hallux quam apud præcedentes longior	104. *Anabatini*, Swains.
AMPELIDÆ.	Rostrum crassum et convexum, non compressum. Remigum primorum secundus apud mares diminutus	105. *Psarini*, Bonap.
	... basi latum, apicem versus compressum. Remex secundus non diminutus	106. *Ampelini*, Swains.
PHYTOTOMIDÆ		107. *Phytotomini*, Swains.
PIPRIDÆ		108. *Piprini*, Swains.
PLATYRHYNCHIDÆ		109. *Platyrhynchini*.
TYRANNIDÆ.	Rostrum magnum et crassum, basi latius quam altius	110. *Tyrannini*, Swains.
	... mediocre, non latius quam altius	111. *Fluvicolini*, Swains.

* E genere *Hybris*, NITZSCH. *Strix flammea* est forma typica hujus generis.

Subfamiliæ.

ERIODORID.E. Latus exterius plantæ { scutulis obtectum. Rostrum { altum et validum, rostro Lanii simile ..... 112. *Thamnophilini*, Swains.
invalidum, rostro Turdi simile ..... 113. *Myiotherini*, Swains.
lamina integra obtectum ..... 114. *Hypocnemidini*, Cabanis.

UPUPID.E. Unguis hallucis { valde incurvus. Caput sine crista ..... 115. *Irrisorini*.
fere rectus. Caput cristatum ..... 116. *Upupini*, Bonap.

ALAUDID.E ..... 117. *Alaudini*, Bonap.

BOMBYCILLID.E ..... 118. *Bombycillini*, Swains.

NECTARINID.E. Numerus remigum primorum { 10. Lingua { penicillata ..... 119. *Melliphagini*, Bonap.
non penicillata ..... 120. *Nectarinini*, G. Gray.
9 ..... 121. *Dacnidini*, Cabanis.

CORVID.E. Rostrum .. { longum, tenue et incurvum ..... 122. *Epimachini*, Cabanis.
crassum, brevisculum vel mediocre. Pedes { magni. Ptilosis maris nonnulla parte plumas ornatas, e ptilosi exstantes, et diverso modo formatas, præbet ..... 123. *Paradiseini*, Bonap.
mediocres. Fissura oris ..... { recta. Maxilla pone apicem { minime, vel indistincte incisa ..... 124. *Corvini*, Bonap.
distincte incisa. Tarsus ..... { digito medio una cum ungue longior ..... 125. *Garrulini*, Swains.
non digito medio cum ungue longior ..... 126. *Oriolini*, Swains.
descendens. Numerus remigum primorum { 10 ..... 127. *Sturnini*, Bonap.
9 ..... 128. *Icterini*, Swains.

FRINGILLID.E. Numerus remigum primorum { 10. Culmen rostri ad basin inter plumas frontales intrans ..... 129. *Ploceini*, Bonap.
9. Palatum { sine tuberculo vel carina ..... 130. *Fringillini*, Bonap.
tuberculo vel carina præditum; mandibula plerumque maxilla major ... 131. *Emberizini*, Bonap.

TANAGRID.E. Rostrum { crassum, plus vel minus conicum, interdum basi dilatatum ..... 132. *Tanagrini*, Bonap.
tenue et subulatum ..... 133. *Sylvicolini*, Bonap.

MOTACILLID.E ..... 134. *Motacillini*, Bonap.

HIRUNDINID.E ..... 135. *Hirundinini*, Bonap.

PARID.E. Digitus extimus { digito intimo multo longior. Hallux et ejus unguis magni ..... 136. *Certhini*, Bonap.
digito intimo non vel parum longior. Rostrum { breve, conicum ..... 137. *Parini*, Bonap.
tenue, et plus vel minus subulatum. Alæ breves et rotundatæ, remige primo dimidio secundi longiore ..... 138. *Troglodytini*, Swains.

SYLVID.E. Rostrum { latum et basi depressum. Pedes minuti ..... 139. *Muscicapini*, Bonap.
compressum. Pedes mediocres vel magni. Rostrum { magnum et validum, pone apicem aduncum maxillæ profunde incisum ..... 140. *Lanini*, Bonap.
mediocre, subulatum, pone apicem maxillæ emarginatum ..... 141. *Sylvini*, Bonap.

REGULID.E ..... 142. *Regulini*, Bonap.

TURDID.E. Alæ { breves, arcuatæ et cavatæ ..... 143. *Cinclini*, Bonap.
mediocres, non cavatæ ..... 144. *Turdini*, Bonap.

2. Report on Birds collected at Windvogelberg, South Africa, by Captain G. E. Bulger, C.M.Z S. By P. L. Sclater, M.A., Ph.D., F.R.S., &c., Secretary to the Society.

Our Corresponding Member, Capt. G. E. Bulger, forwarded to me some time back a small collection of bird-skins made at Windvogelberg, in British Kaffraria. Not being myself specially acquainted with African birds, I have submitted Capt. Bulger's series to the examination of my friend Dr. Hartlaub of Bremen, our leading authority on this subject, who has kindly determined the species. Two of them proved to be new to science, one of which (*Saxicola spectabilis*) has been already described in these 'Proceedings;' the other (*Hemipteryx immaculata*) is characterized below.

Capt. Bulger sends me the following account of the locality where his specimens were collected :—

"Windvogelberg is a lofty and almost isolated mountain of British Kaffraria, 5344 feet above the level of the sea, and situated in 32° 17′ 50″ S. lat. and 27° 7′ 3″ E. long. It lies about twenty miles north of the great Amatola range, and rather more than three leagues to the southward of the Kei River, which separates Kaffraria from Kaffirland and the province of New Victoria. The country in its neighbourhood is almost entirely destitute of trees, being, for many miles to the south and east, a vast extent of grass-covered land, misnamed "flats," inasmuch as they are throughout characterized by strongly marked undulations almost amounting to the dignity of hills and valleys. To the northward and westward these deep rolling swells assume the magnitude of mountains, with high krantzes*, and strange-looking naked peaks, here and there relieving the generally monotonous features of the country.

"The lonely little post at the foot of the Windvogelberg is at present (Jan. 1864) the most advanced station occupied by the Queen's troops, though the white settlements extend much further; and its garrison consists of eighty men of the 2nd Battalion, 10th Regiment, and seven of the Cape Mounted Rifles.

"The Doorn or Thorn River runs within a few miles of the barracks, the nearest elbow being about 3000 yards distant; and a small brook comes down through a deep kloof† in the mountain, and supplies the post with water. The banks of both these streams are, in some parts, rocky, and those of the latter are decked with small trees and bushes for a short distance. There are some enormous krantzes on the mountain, and here and there dense patches of shrubby vegetation. Amongst the former, Rock Rabbits (*Hyrax capensis*) make their secure and inaccessible homes; and small birds of various kinds occupy the latter in considerable numbers. Rock-Thrushes (*Petrocincla*) and Red-breasted Woodpeckers (*Geocolaptes arator*) are abundant on the highest pinnacles; and on the scattered stones below, *Saxicolæ* of several kinds are always to be found."

* Krantz, a precipice.

† Kloof, a ravine.

The species collected by Capt. Bulger, as determined by Dr. Hartlaub, are the following:—

ACCIPITRES.

1. Tinnunculus rupicola (ad.), Daud.; Bp. Consp. p. 27.

PICARIÆ.

2. Pionus robustus (Gm.).

3. Oxylophus glandarius (L.).

4. Geocolaptes arator, Cuv.

5. Alcedo semitorquata, Sws.; Bp. Consp. p. 159.

6. Corythornis cristata, L.; Bp. Consp. p. 159.

PASSERES.

7. Hirundo capensis (ad.), Gmel.; Bp. Consp. p. 339.

8. Cotyle palustris (ad.), Steph.; Bp. Consp. p. 342.

9. Nectarinia formosa (♂ ♀), Linn.; Bp. Consp. p. 404.

10. Nectarinia afra, Linn.; Bp. Consp. p. 407.

11. Drymœca subruficapilla, Smith.

Rather larger apparently. One specimen has the upper tail-coverts rufous.

12. Hemipteryx immaculata, Hartlaub, sp. nov.

Supra rufescenti-olivacea, fusco variegata; sincipite, tergo et uropygio magis rufescentibus; subtus immaculata, fulvescens, gula et abdomine medio albidioribus; rectricibus fusco-nigris, macula alba terminatis; remigibus in margine interno pallidis; subalaribus isabellinis; pedibus et mandibula pallidis.

Long. 3″ 10‴, rostr. a fr. 3¼‴, al. 1″ 9‴, caud. 9‴.

Obs. A typical *Hemipteryx*, differing in its unspotted under surface from *H. textrix*, the only known species.

13. Myrmecocichla æthiops, Licht.; Bp. Consp. p. 302.

14. Campicola pileata, Gmel.; Bp. Consp. p. 304.

15. Saxicola spectabilis, Hartlaub, P. Z. S. 1865, p. 428, pl. xxiii.

See Mr. Layard's notes on the habits of this new species (P. Z. S. 1865, p. 619)*.

16. Pratincola sibylla, Gmel.; Bp. Consp. p. 304.

* Dr. Hartlaub has since informed me that this species is certainly the same as Temminck's *S. bifasciata*, Pl. Col. 472.—P. L. S.

17. Chætops frenatus, Temm.; Bp. Consp. p. 278.
18. Luscinia sinuata, Sundev.
19. Bessonornis phœnicurus, Gmel.; Bp. Consp. p. 301.
20. Petrocincla explorator, Vieill.; Bp. Consp. p. 297.
21. Macronyx capensis, Linn.; Bp. Consp. p. 247.
22. Alauda pyrrhonota, Vieill.; Bp. Consp. p. 245.
23. Alauda cinerea, Lath.; Bp. Consp. p. 244.
24. Certhilauda subcoronata, Smith; Bp. Consp. p. 246.
25. Hyphantornis spilonotus, Vig.; Bp. Consp. p. 441.
26. Hyphantornis olivaceus, Hahn.
27. Chera progne, Bodd.; Bp. Consp. p. 448.
28. Euplectes capensis, L.; Bp. Consp. p. 447.
29. Steganura paradisea, Linn.; Bp. Consp. p. 449.
30. Crithagra sulphurata, Ill.; Bp. Consp. p. 522.
31. Crithagra canicollis, Sws.; Bp. Consp. p. 523.
32. Poliospiza gularis, Smith; Bp. Consp. p. 519.
33. Passer arcuatus, Gmel.; Bp. Consp. p. 510.
34. Fringillaria capensis, Linn.; Bp. Consp. p. 467.
35. Corvus cafer, Licht.

COLUMBÆ.

36. Turtur semitorquatus, Sw.

GALLINÆ.

37. Coturnix communis, Bonn.
38. Francolinus afer, Lath.
39. Hemipodius andalusicus (Gm.).

GRALLÆ.

40. Charadrius melanopterus, Rüpp.
41. Ægialites tricollaris (Vieill.).
42. Machetes pugnax (L.).
43. Fulica cristata, Gm.
44. Scopus umbretta, Gm.

3. Description of a New Species of Toucan belonging to the Genus *Aulacoramphus*. By John Gould, F.R.S., &c.

Aulacoramphus cyanolæmus.

Male. Bill black, with a small mark of yellow at the tip of the upper mandible, and a band of white at the base of both mandibles except on the culmen; this white band is much narrower on the upper than on the lower mandible, and moreover has the posterior half of its breadth pale yellow; naked skin around the eyes dull red; throat greyish blue, approaching to violet, and becoming of a deeper tint where it joins the green of the neck; a tinge of blue also appears at the base of the ear-coverts, towards the bill, and over the eye, where, however, it becomes of a greener hue; plumage of the head and body deep grass-green, with a wash of yellow on the flanks; primaries black, edged with brown; under surface of the wing pale yellow; tail-feathers deep green, conspicuously tipped with chestnut; under tail-coverts chestnut-brown; legs green.

Total length of male 12 inches, bill $2\frac{7}{8}$, wing $5\frac{1}{4}$, tail $5\frac{1}{2}$, tarsi $1\frac{1}{4}$.

Female. Precisely similar in colour, but, as is the case with all the other species of the genus, much smaller than the male.

Hab. Loxa in Ecuador.

Remark.—This well-marked species is allied to the *Aulacoramphus cæruleigularis* of Panama and the *A. atrigularis* of Peru, but differs from the former in the smaller extent of the blue on the throat, from the latter in having no trace of black on that part, and from both in the markings of the bill.

4. Description of Two New Forms of Gorgonioid Corals. By Dr. John Edward Gray, F.R.S., V.P.Z.S., &c.

The other day a few Corals from Japan were sent to me for examination; and among a series of well-known species of Stony Corals (*Melitæa*), and several kinds of the coral-like *Algæ* belonging to the genus *Corallina* and its allies, I discovered a small fragment of a *Gorgonia*-like Coral that was studded with little horny cups, which I was at first inclined to believe were some parasitic animals that had fixed themselves on the coral, for they were entirely unlike any cells that I have ever observed on a Gorgonioid Coral.

Careful examination has satisfied me that the little cups are an essential part of the coral, and that the latter is a form entirely new to science, its nearest ally being of the genus *Primnoa*, the species *P. antarctica*, found in the Antarctic Seas.

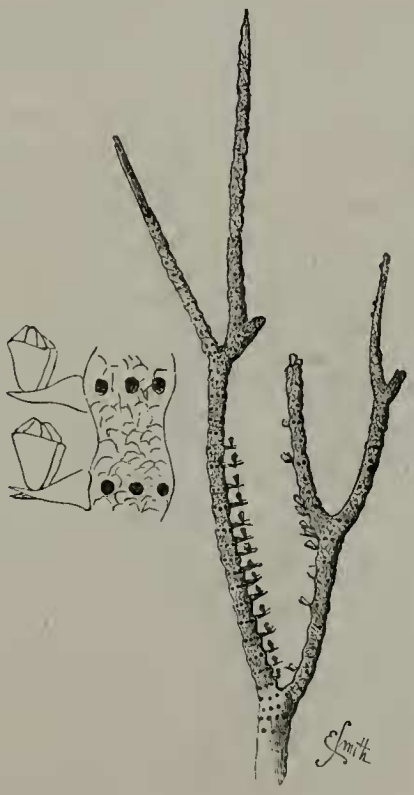
It differs entirely from all the other genera of the group in the tubes of the polype being formed of two obconic cells placed one on the other.

In *Primnoa* the cells are produced and covered with calcareous scales, which are imbricated like slates on a house.

Calyptrophora.

The coral cylindrical, furcately branched; the branches elongate, subsimple; the axis horny; the bark thin, smooth, calcareous, with regular equidistant whorls of cells; cells with a circular mouth having a raised edge, placed close together and forming a raised ring round the coral. Each cell is furnished with two obconic pellucid cells placed one on the other; the lower cell is pellucid, apparently articulated to the axis of the coral, very narrow near the mouth

Fig. 1.



Calyptrophora japonica.

of the cell and wide at the other end; the lower surface of the outer aperture is furnished with two elongated horn-like processes. To the centre of this basal cone is articulated or affixed a similar pellucid horn-coloured cone or rather conical vase, which is furnished with a slightly keeled edge at its widest part, and then contracts as if it had a shorter conical lid, with an aperture in the middle of this lid-like contracted part for the emission of the polype. The two cones are as it were articulated to the stem; and the lower one stands at right angles with regard to it, and the upper at right angles with regard to the lower one, so that the aperture of the upper one is vertical.

These two cones are only preserved on the inner side of the branches, where they have been protected from erosion, during the carriage of the coral from Japan, by the branches opposite to them. It might be said that they are not naturally found in any other part; but there are some remains of them, enough to show their existence, in various other parts of the specimen.

If they had not fortunately been preserved in some part of the coral, one might have been led to describe the coral as furnished with close rings of cells with open circular mouth: but this form of the mouth ought to have attracted one's attention; the mouth of the cells of the Barked Corals is always closed by the contracted part of the polype. But one might have believed that in this specimen the contracted portion had been worn away by erosion. The species may be called *Calyptrophora japonica*. (Fig. 1.)

Japan has produced some curious marine productions, as, for example, the "Glass Plant," better called the "Glass Rope" (*Hyalonema*). This Coral was for several years considered a great rarity; but it must be common on the Japanese coast, for hardly a vessel comes from that country without bringing specimens of it. And lately we have been rather surprised at hearing that the same genus is found nearer home, on the coast of Portugal.

It has been lately shown that *Hyalonema* belongs to the Actinoid Polypes, near to *Zoanthus* and, especially, *Corticaria*. I have verified this by an examination of the animal after soaking it in water; and it is surprising that the number of folds round the mouth of the cell had not led one to believe it before. This is a group of animals in which anything like a central axis has not been observed before; but I believe that the siliceous glass-like fibres really belong to the animal that covers them. The two are always found in connexion, both in Japan and in Portugal; so that I can only regard the theory of Mr. Bowerbank and some of the German naturalists, that the siliceous fibres belong to the sponge in which the Coral is sometimes imbedded, and that the animal is only parasitic upon them, as not consistent with our knowledge.

The second Coral I discovered among a number of Zoophytes from the Cape of Good Hope, which Mrs. Alfred Gatty brought to the British Museum for my inspection; they had been sent to her by Dr. Rubidge.

This collection contained several very interesting kinds of Sponges and smaller Zoophytes along with two specimens of the Coral under consideration, and a specimen which seems to be allied to it, from which the bark had been washed.

This Cape Coral is nearly allied to the *Paragorgia* of M. Milne-Edwards; but the axis is much more solid and regular, having none of the friability or porous sponginess of the axis of that Coral. This is much more slender, which is consistent with the greater hardness and uniformity of texture of the axis.

I have no doubt there are several species of these Corals to be described.

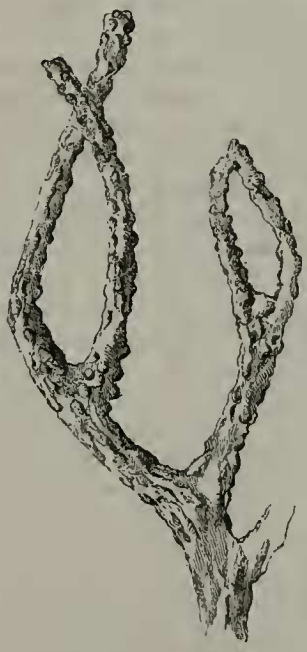
The one under consideration may be named

Homophyton.

Coral arborescent, rather flabellate, furcately branched; branches subcylindrical, elongate; axis wood-like, soft, formed of numerous spicula, intermixed with a cellular substance; bark thin, with a smooth external surface; the cells of the polypes forming five longitudinal series of compressed tubercles, those of the neighbouring series alternating on the ends of the younger branches, becoming further apart, more irregularly distributed, and scarcely elevated in the older part of the branches.

This genus differs from *Paragorgia* of Milne-Edwards (Coralliers, i. p. 191) in the axis being of a uniform cork-like texture, without any tubes or spongy cavities.

Fig. 2.



Homophyton gattyiæ.

Homophyton gattyiæ.

The coral erect, subflabellate, irregularly furcately branched; the branches long, subcylindrical, with sinuous grooves on the surface running between the polype-cells, which are scarcely raised above the general surface of the bark; the terminal branches rather slender, elongate, pentangular, with deep grooves between the oblong, rather compressed polype-cells; the bark dark red, when dry; the axis yellow.

Hab. The sea, near the Cape of Good Hope (*Dr. Rubidge*).

I have named this species after Mrs. Alfred Gatty, so well known for her fondness for natural history, and her interesting 'Parable of Nature,' and other works.

5. On the Movement of the Symphysis of the Lower Jaw in the Kangaroos. By James Murie, Prosector to the Society, and A. D. Bartlett, Superintendent of the Society's Gardens.

A short time ago, a lady, a frequent visitor at the Gardens, on conversing with the keeper of the Kangaroos, asked him if he was aware of the manner in which these animals used the teeth of the lower jaws to snip their food as a person would do in snipping grass with a pair of scissors. She mentioned that she had resided many years in Australia, and seemed quite positive as to the truth of the fact that Kangaroos used their lower incisors in the manner already spoken of. The keeper, interested in what had been told him, called the attention of Mr. Bartlett to it.

Mr. Bartlett immediately examined the teeth and jaws of several skulls of Kangaroos in his possession, and, satisfied of the probable truth of the remark, took the first opportunity of observing the same in the living animals in the Society's Collection.

Since then we have corroborated and added to these observations together. The following were the different species of the living animals examined for this purpose,—viz. the Red Kangaroo (*Macropus rufus*), the Black-faced Kangaroo (*M. melanops*), the Great Kangaroo (*M. giganteus*), the Yellow-footed Rock Kangaroo (*Petrogale xanthopus*), Bennett's Wallaby (*Halmaturus bennettii*), and the Derbian Wallaby (*H. derbianus*).

In these several species we noticed the following movements:—As the animal opened its mouth and seized the grass offered it, there was a slight though distinct separation of the lower incisors, differing in each individual according to its size,—in the large Kangaroo almost as much as a quarter of an inch.

The small mouthful of grass being seized, the green blades were cropped or nipped off, a portion being evidently cut through by the anterior free sharp edge of the two lower incisors as they pressed against the opposing concavity of the palate and the cutting-edge of the upper and anterior incisors; while another portion of the food passed between the two lower incisors, and seemed also to be snipped through either by the closure or approach of the trenchant internal lateral edges of these, or it might be by the jerking movement of the head, which caused the morsel to be half torn and half cut through by these incisors. At other times, when the grass was in small loose bundles of a few of the stronger fibres with their roots attached, instead of chewing the latter, the animal rather rejected them; but in order to do so grasped the roots or dry portion of the stem, which it wished to disengage, with its fore paws, using the claws in the manner a human being would the fingers and hands to clutch and drag an object. While doing this, what stalks were between the lower incisors were severed by their internal acute borders. After the grass had thus been cut through, it was passed between

the molars, partly by the aid of the tongue and partly by the movement of the jaws, and then, with the ordinary side to side and semi-rotatory movement, the process of mastication was completed by the molars.

In watching the animals, it was at first difficult to notice the action of the jaws and lower incisors which we have spoken of; and this was to be accounted for by the great rapidity of the movement, which was also sometimes hidden by the retraction of the lips. The opening movement of the lower incisors seemed chiefly to occur when the animal raised its head to seize the food; for while in the act of chewing with the molars, the incisors were either closed or hidden by the lips.

With reference to the movement of the head in animals which graze or browse, as for instance in the sheep, the direction of motion while in the act of cropping the grass is nearly always upward and forward, though every now and again the reverse is the case. In the Kangaroos, however, we did not observe this latter motion, the jerking movement being invariably in a forward direction. This would seem to agree with and favour the act of the grass slipping between the open incisors; and as these are closed the short quick movement of the head would likewise tend to cut asunder the stalk or blade of the leaf. Besides the direct forward jerk, the head at the same time moved slightly laterally, though this was not so very perceptible.

From these observations, then, we are inclined to believe that the lower incisor teeth in the Kangaroos act in the manner either of a pair of cutting-forceps or short-bladed scissors (see fig. 2), with also occasionally a knife-like action; that is to say, the lower incisors themselves, if to a certain extent fixed, would on their closure prevent the blade of grass from slipping (from, in many cases, their points being perfectly close and their bases more open), and the jerk combined with the dragging movement would cut it through.

Upon consulting the various authorities as to what has been said respecting the movement of the teeth and lower jaws of the family of Kangaroos, we find Mr. Waterhouse states, in his admirable work the 'Natural History of the Mammalia,' vol. i. p. 51, of the *Macropodidæ*, that "the lower incisors are horizontal, long, compressed, and lanceolate, and have cutting external and internal margins; their outer surface is convex, and the inner surface is strongly convex in the transverse direction, in the middle, but concave near the margins; when the mouth is closed, the outer cutting-edge of the lower incisors is brought in contact with the cutting-edges of the posterior incisors of the upper jaw on either side, and their points shut within the apex of the foremost pair of the upper jaw. In *Macropus major* (and perhaps in some nearly allied species) the rami of the lower jaw are loosely attached at the chin, and at the apex they are free, and the animal has the power of slightly separating the lower incisors, so that their outer cutting-edges are brought more closely in contact with the upper incisors than they otherwise would be."

Although Mr. Waterhouse therefore has pointed out both the

cutting-edges of the outer and inner sides of the lower incisors, and justly attributed to the closing of the lower upon the upper jaw with the separation of the lower incisors the effect of producing closer contact between the cutting-edges of both jaws upon one another, yet he has failed to notice the use, and mode of application of the *inner* cutting-edges of the lower incisors.

Professor Owen, in his valuable memoir "on the Osteology of the Marsupialia," in the 'Transactions of the Zoological Society,' 1841, vol. ii. p. 394, does not mention anything from which it would be inferred that the lower incisors are used in the manner we have described; he says, however, among other things, that, excepting the Koala, "in all the other marsupial *crania* which I have examined, the *rami* of the lower jaw are not anchylosed at the symphysis."

Having satisfied ourselves of the occurrence of the mobility of the teeth and symphysis of the lower jaws in the living animals, it became an object of interest to ascertain in the dead ones how this was produced; and for this purpose we commenced by studying the bones in a few macerated skulls.

In one of these, an adult specimen of *Macropus major* (*M. giganteus*), the two halves of the inferior maxilla of which have been completely separated, when the symphyses are applied closely together the two lower incisors are approximated at their anterior half or points upon the inner edges; while the posterior halves of the incisors have an interval of nearly one-eighth of an inch, of a somewhat spear-shape. The two margins of the incisors in apposition are worn and flattened, evidently by the continued attrition of the one upon the other. The symphysis of the bones at the part where they are most closely applied is at the posterior half; and there they unite, though loosely, by an articulation in the manner of a diaphysis.

In a *Macropus ocydromus* the symphysis and teeth of the mandible exhibit very nearly the same appearances.

The same parts in *Osphranter antilopinus* differ in the anterior and inner cutting-edges of the incisors not coming together so sharply, by reason of the points being more rounded and set outwards than in the two former species. When the teeth are separated there is an open space of fully one-eighth of an inch; there is also a diminutive ovate space at their base, which may in part be a natural deficiency; but likewise the dental tissue seems partially abraded as if worn by the action spoken of, possibly by the tearing of grasses or other, harder stems.

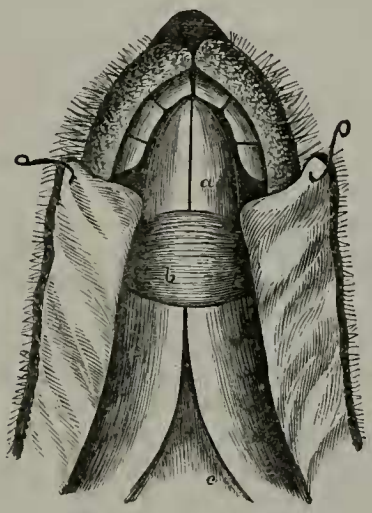
The shape and position of the incisors of *Halmaturus agilis* approach those of *Macropus major*; the interval at the base of the teeth, however, is relatively wider and correspondingly shorter than in that larger species.

Halmaturus irma presents no remarkable difference from *Macropus major*, excepting in the mandible being less in dimensions, and consequently having a smaller separation of the teeth.

Besides an examination of the dried bones, we have been fortunate in having the opportunity of studying the appearances in two animals which have recently died in the Gardens. In one of these, Bennett's

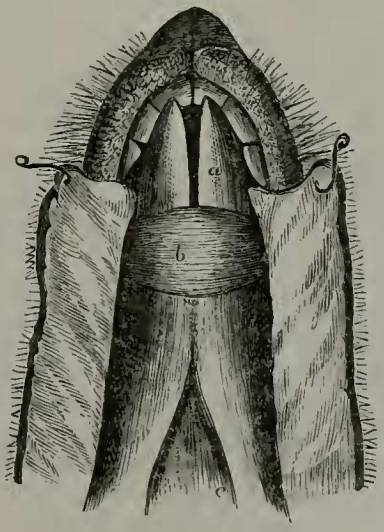
Kangaroo (*Halmaturus bennettii*), a young female, the teeth of the lower jaw when close together, as Mr. Waterhouse remarks, fit

Fig. 1.



Partial dissection of the lower jaw of *Halmaturus bennettii*, showing (*a*) the incisors in close apposition, (*b*) fibres of the orbicularis oris muscle, (*c*) anterior portion of the genio-hyoid muscle of left side, the median line of separation from its fellow of the right side being hardly distinguishable.

Fig. 2.



The same dissection of the mandible of *Halmaturus bennettii* as in fig. 1, but showing (at *a*) the manner of separation of the lower incisors, and how they also override the anterior upper incisors.

within the apex of the foremost pair of incisors of the upper jaw, the two sharp inner edges of the lower incisors coming so close together that the line of separation (fig. 1, *a*) is hardly distinguishable; but when the angles of the inferior maxilla are slightly approximated, as, for instance, by a gentle pressure of the thumb and fore finger, then the two teeth open like the blades of a pair of scissors at their points, as much as one-eighth of an inch, and, according to what Mr. Waterhouse says, their outer cutting-edges are brought more closely in contact with the inner edge of the anterior upper incisors; but at the same time it must be remarked they can also overlap them (fig. 2, *a*). But whether this overlapping takes place ordinarily, when the creature crops its food, we are not prepared to say, as it is not readily distinguishable, from the rapidity of the act.

In the second specimen of Kangaroo (*Petrogale brachyotis*), an adult female, the tips of the lower incisors could be separated almost one-fourth of an inch, and the structure was in nearly all respects similar to that of Bennett's Kangaroo—with this difference, that in *Petrogale brachyotis* there was an interspace at the base of the lower incisors, even when the points of the teeth were brought in contact; while in *Halmaturus bennettii* the whole of the inner edges were applied closely to each other (fig. 1, *a*). It is possible that this slight hollow may have been caused by a wearing away of the substance; that it existed in the adult animal gives feasibility to this belief.

The next point of interest connected with this remarkable movement is the consideration of what muscular apparatus or set of muscles produces it.

The great breadth and increased size of the inner hollow of the ramus and angle of the mandible in the Marsupials at once suggests that the pterygoid muscles, from their increased purchase and position, would entirely effect this, as it does, to a great extent, in the bovine race the process of rumination. No doubt these muscles are concerned in the motive act of the one half of the mandible upon the other in the Kangaroos; but certain other muscular fibres seem also to be called strongly into play.

The thin layer of the platysma myoides on either side appears to have a slight influence in the production of the opening of the incisors, by gently aiding the approximation of the angles of the lower jaw.

The digastric muscles, moderately strong in the specimens dissected, have their usual origin and median tendon slightly in advance of the angles. Their anterior fleshy bellies are inserted half an inch or so behind the posterior junction of the symphysis, so that on contraction of their fibres they serve to pull together the posterior rami, and also produce the aforesaid separation of the lower incisors.

The two mylo-hyoidei are not extraordinarily large, although broad; but their position and nearly transverse direction give them even a more direct and important action in the opening movement than the last.

The genio-hyoidei are, on the contrary, strong and well developed. Their point of traction from the hyoid bone, and apparent tenseness

while the incisors are asunder, leads to the inference that they likewise modify and aid the opening movement, although mere position and the parallelism of their fibres to the median line of divergence (at least as they appear on dissection) makes one hesitate to attribute too much power to them; but they certainly act along with, and greatly strengthen the force of, the mylo-hyoidei.

By the conjoined simultaneous action of the whole of the muscles mentioned, the movement of the symphysis and separation of the incisors seem to be effected; while the return to the state of closure follows relaxation of these, with possibly contraction of one of the pterygoid muscles. The chief agent, however, in the approximation of the anterior portions of the symphysis and the internal edges of the incisors is no doubt the transverse fibres of the orbicularis oris (here situated at the anterior portion of the bony symphysis and the root of the lower incisors), which, although delicate medially, is nevertheless well developed laterally (see figs. 1 and 2, *b*).

In proof that the portion of the symphysis in close juxtaposition are the pivot or point of leverage in the movement spoken of, and that the muscles stated are those concerned in the action, a partially dissected specimen need only be experimented on, when very gentle inward pushing at the angle will be seen to produce the separation of the incisors; and a like force applied in advance of the pivot (*e. g.* where the orbicular muscle is placed) immediately and easily causes closure.

Hence, as to the point at issue, we have tried to show from our observations the analogy of the movements and use of the mandible and incisors of the Kangaroo to those of a pair of cutting-forceps or scissors, the posterior part of the symphysis being the pivot, the angles the handles, and the incisors the blades, the inner edge of which is the cutting-edge.

The manner of use, at least in confinement, we have attempted to describe; but whether the teeth are put to the same use when the animal is in a state of nature is a fact unknown to us. Mr. Gould, whose opportunities of observation of their native habits was at one time great, informs us that the food of the *Petrogale brachyotis* is often dry and tough vegetables obtained among rocky places. It is possible therefore that the cutting-edges in that case might well serve to sever dry or fibrous material.

P.S. Since this paper was read, our attention has been called by Dr. J. E. Gray to a paragraph in 'The Book of Nature,' by John Mason Good (vol. i. p. 254), where the author says, "The *Mus maritimus*, or African Rat, the largest species of this genus which has hitherto been discovered, and seldom less than a full-sized rabbit, has the singular property of separating at pleasure to a considerable distance the two front teeth of the lower jaw, which are not less than an inch and a quarter long. That elegant and extraordinary creature the Kangaroo, which we may soon hope to see naturalized in our own country, is possessed of a similar faculty."

But this statement does not seem to forestall the facts which we have observed regarding the use or manner of action of the lower

incisors in these Marsupials; nor does it even express either so definitely or clearly some of the peculiarities of the movement as observations which we have quoted at length.

January 23, 1866.

Dr. J. E. Gray, F.R.S., V.P., in the Chair.

Mr. P. L. Sclater exhibited an egg of the One-carunculated Cassowary (*Casuarius uniappendiculatus*, Blyth), laid by the female bird in the Zoological Gardens, Amsterdam. The egg was of the usual form and colour of the eggs of the genus *Casuarius*, being of a pale green, thickly covered with raised spots of dark green, and measuring 5·4 by 3·6 inches.

Mr. Sclater called the attention of the Society to the great scarcity in European collections of specimens of the American Lepidosiren (*Lepidosiren paradoxa*). But two examples of this creature had been obtained by Natterer, its original discoverer,—one from a water-ditch near Borba on the Madeira, where it appeared to be known to the inhabitants by the name "*Caramuru*;" the other in a marsh on the right bank of the Amazons, above Villa Nova. These specimens were now in the Imperial Zoological Cabinet at Vienna.

The only other travellers who appeared to have met with this singular form were MM. Castelnau and Deville, who obtained a single specimen of a Lepidosiren from a lake on the Ucayali, which M. de Castelnau, in the volume devoted to the fishes collected by his expedition, has referred to a second species of the genus, under the name *L. dissimilis*.

Neither Mr. Wallace nor Mr. Bates had obtained specimens of this animal during their Amazonian wanderings. Mr. Wallace had only heard of it. Mr. Bates had replied as follows in answer to Mr. Sclater's inquiries on the subject:—

"What I have to tell you about the *Lepidosiren* of the Amazons is very little. Judging from my experience (having made constant inquiries about it during the three years I was living in the proper localities, without obtaining a specimen), it is not easy to get; but another traveller, having means of obtaining a good boat's crew during the dry months (which I had not), might be more successful. I exhibited drawings to many native fishermen, and they recognized the *Lepidosiren* as a fish they occasionally find in the mud at the bottom of the great lakes when they spend the dry seasons in harpooning and salting Pirarecú (*Sudis gigas*). They call it in the Tupi language '*Tambaki-mboya*,' i. e. *Tambaki* (a very common eatable fish, of the family *Characini*), *mboya*, false, it being scaled similarly to the